Cretaceous birds

Hesperornithiformes
Hesperornis
crassipes -- Kansas
montana -- Montana
regalis -- Kansas
Coniornis altus -- Montana
Hargeria gracilis -- Kansas
Baptornis advenus -- Kansas

Neogaeornis wetzeli -- Chile
(tarsometatarsus)

Enaliornis -- Cambridge
barretti (misc. bones)
sedgwicki(leg bones)

Ichthyornithiformes
Ichthyornis
agilis -- Kansas
anceps "
dispar "
lentus -- Texas
tener -- Kansas
validus "
victor "
Apatornis celer -- Kansas
Cimolopteryx -- Wyoming
rarus -- coracoid, scapula
retusus-- "

Caenagnathiformes
Caenagnathus (Canada

Anseriformes
Gallornis straeleni -- France
(femur) "ancestral goose"?

Ciconiiformes
Scaniornis lundgreni-- Sweden
(coracoid) "ancestral flamingo"?
Parascaniornis stensioi -- Sweden
(vertebrae)"ancestral flamingo"?

Pelecaniformes
Elopteryx nopscai -- Transylvania
(hind limb bones) "ancestral cormorant"?

Eocene birds

about 58 of which 37 U.S. (8 of these Paleocene)

Colymbi-gaviiformes
Colymboides anglicus -- Hampshire
(coracoid and sternal fragment)

Procellari-pelecaniformes
Gigantornis eaglesomei -- Africa (age?)
(sternum)
Odontopteryx toliapica -- London (suggestion of flamingo and crane)
(skull, tarsal and ulnar frags.)
(secondarily serrated)
Pseudodontornis longirostris -- Brazil
(skull, similar to O. toliapica) age?
Argillornis longipennis -- Brussels (cranium, humerus, ulna) Sulid ?

Pelecaniformes
Phalacrocoraci-sulidae
Eostega lebedinskyi -- Transylvania
(mandible)
Pelecanidae
Protopelecanus -- Montmartre (scapula)
Anhingidae
Prophaethon shrubsolei -- London
(mandible, cranium, femur, pelvis)
Protoplotus beauforti -- Sumatra
(plaque of most of skeleton) similar to Anhinga and Plotus
Phalacrocoracidae?
Actiornis anglicus -- Hampshire
(ulna, prox.)

Ciconiiformes
Phoenicopteridae
Elornis anglicus -- Hampshire, England
(humerus)
Agnopteridae (related to flamingoes)
Agnopterus
laurillardi (tibiotarsus)-- France
hantoniensis (coracoid and femur) -- Hampshire, England
Threskornithidae
Ibidopsis hordwelliensis -- Hampshire, England
(Tibiotarsus, rostrum, humerus)
Ardeidae
Botauroides parvus -- Wyoming
(tarsometatarsus frag.)
Eoceornis ardetta -- Wyoming
(sternum, frag.)
Proherodius oweni -- London
(sternum, tarsometatarsus)

Anseriformes
Link between ducks and geese?
Romainvillia stehlini -- France
(coracoid, furcula, metacarpus, tarsometatarsus)

Falconiformes
Accipitridae?
Lithornis vulturinus -- London
(sternum, coracoid, humerus, vertebrae, femur, tibia)
Aegypiine or cathartid?
Paleocircus cuvieri -- Hampshire
(metacarpus)

Eocene birds, con'td

4 Galliformes
Gallinuloididae (link between Megapodes and Curassows)
Gallinuloidea wyomingensis -- Wyoming
(nearly compelte skeleton
Phasianidae
Palaeophasianus meleagroides -- Wyoming
(tibia, tarsus)
Paleortyx
hoffmanni - France (nearly complete)
blanchardi - France (nearly all bones)

21 Gruiformes
Link between rails and gallinules
Eocrex primus - Colorado
(distal tibia)
Rallidae
Paleorallus troxelli - Wyoming)
(distal tibia)
Quercyrallus intermedius -- France
(skull jaws, vertebrae, limb bones, etc.)
Fulicaletornis venustus -- Wyoming
(tibiotarsus) coot?
Telmatornis
priscus -- New Jersey -- Humerus
rex -- New Jersey, humerus
Gypsornis cuvieri -- France
(Tarsus)
Paragrus prenticei --
Geranoides gipsonii -
Paleogrus hordwelliensis
" princeps
Protogrus nobilis
" marshi
Geranopsis hastingsiae
Aletornis pernix

4 Striginformes

Orders known at beginning of Tertiary

Columbi-gaviiformes - Cret.?

Pelecaniformes Cret.

Ansériformes Cret.

Ciconiiformes Cret.

Falconiformes ½ Eoc?

Gruiformes Eoc

see Lydekker 363-364, fig 73

Prohesperornis of Low. Eoc of London

sternum carina quite ½ at high level

[redacted] sacral & dorsal fusion

Phoenicopteri - resemble Ardea

Eocconus ardetta Ameg. t. fig 102, pl 13, p 39,

coracoidal apophysis decumbent left above R

as in Apatornis, Ichthyornis, Ardea & Accipitres. Wyo. Bridger Eoc.

Ibidopsis - tibia - dist end narrower than is usual in Ibis & prox. cremial crest not so deep. Upper Eoc - Eng.

Prosthibis of Patagonia Miocene (Santa Cruz)

shaft of tarsus broader than Ibis & Platalea

Ameghino 1895 pp 596-597 fig 42

1891 p 245

Brachycaudus distinguished from
Scamonius lundgreni by lower ulnar condyle
+ lower ectepicond. process.

No mention of scap. facet of Scamonius
being a cup (as it definitely is in Brachycaudus
+ is so marked as to be mentioned.

Scamoriothidae
large

Apatornis
small

Southe American Fossil Birds

Cretaceous -- Chilean beds -- Neogaeornis

Eocene -- None until now

Oligocene - Deseado

Upper Oligocene Pyrotherium beds and Deseado formation -- Patagonia
Penguins -- Palaeosphensicus gracilis Ameghino
Cruschedula revola Ameghino
Cladornis pachypus Amerghino
Anseriform? -- Loxornis clivus Ameghino (Dames likens to Pelycyornis)
Phororhacid? -- Physornis fortis Ameghino

Miocene - Patagonian

Seymour Island, Patagonia -- 6 penguins
San Julian, Patagonia -- 8 penguins
Trelew, Chubut, Patagonia -- 12 penguins
Rio Seco, Patagonia -- 5 penguins

Oligocene-Miocene (Santa Cruz beds) Phororhacidae and Brontornithidae and
La Cueva, Patagonia -- Liptornis hesternus (suline)
Tagua Quemada -- Thegornis musculosus -- falconiform
Korriguen Kaik -- Thegornis xxxxxxxxxx debilis
Patagonia -- Anissolornis excavatus -- phasianis
Staphylornis gallardoi Mercerat -- shearwater
" erithacus "
MonteObservacion -- Eoneornis australis Ameghino -- anseriform
Eutelornis patagonicus " -- "
Protibis cnemialis -- ibis
Lujan -- Pseudosterna degener Mercerat -- tern
Arrecifes -- Pseudosterna pampeana
Eurypnotus argentinus-- Limpkin
" brachypterus -- "
La Plata (Pampeano medio: Piso belgranense) -- Chenalopex debilis
From several localities of SantaCruzean age 3 species of Pelecyornis.

Pliocene
Lower Pliocene of Santa Maria, Prov. Catamarca
Prophororhacus incertus
Procariama simplex

Middle pliocene (Hermosense of Monte Hermoso
Tinamisornis intermedius and T. parvulus
Hermosironis Milne-edwardsi
" australis
Foetopterus ambiguus -- falconiform

Upper Pliocene -- Sarcorhamphus patruus

EOCENE BIRDS OF NORTH AMERICA

Diatryma-N. Mex., Wyoming, New Jersey
Omorhamphus -- Wyoming
Palaeophasianus meleagroides Shufeldt - Wyom.
Paragrus prentici Loomis -- Wyom.
Mautilornis (2 sps.) auks (Wetmore)
Presbyornis pervetus -- avocet (Wetmore)
Botaurides parvus Shufeldt -- Midle Eoc. Wyoming
Eoceornis ardetta Shufeldt - " " "
Eopteryx mississippiensis O. Meyer Mid.Eoc., Wyo,.
Limosavis velox (Graculavus) Marsh -- shorebird
2 other species of Graculavus
Telmatornis (2 sps. rails
Palaeotrings (2 sps.)
} Eoc. New Jersey (Hornerstown)
Laornis edwardsianus Marsh -- water bird inc. sed. New Jersey
Palaeotringa vetus -- Arneytown New Jersey -- shorebird (Lambrecht)
Protogrus nobilis - mid. eoc. Wyom. (Marsh)
Tringa bellus -- shorebird "" " (Marsh)
Bubo leptosteus -- " " " "
Ga linuloides wyomingensis - Mid. Eoc. Wyom. (Eastman)
Aquila ferox
Aletornis pernix
Protogrus marshi
Philohela gracilis
Uintornis lucaris
} Mid. Eoc.(Bridger) Wyom.
Minerva
Aquila lydekkeri
Fuilcaletornis venustus
Hydrotherikornis - Up. Eoc. Oregon (A.H.Miller)
Eocrex primus Wetmore -- Colorado
Palaeorallus troxelliWetmore -- Colorado

So. American Fossil Anseriforms

Loxornis clivus Ameghino 1895
1895 Ameghino pp. 595-596, fig. 41
1914 Loomis: The Deseado formation of Patagonia pp. 225-232 figl 151-154.
From the Pyrotheriumbeds of the Deseado River, Patagonia distal end of tibiotarsus -- Ameghino
Loomis described humerus, sternum and coracoid from "Chico del Chubut west of Puerto Vissa" and assigned to L. clivus.

Eoneornis australis Ameghino 1895
1895. Ameghino: Sur les oiseaux fossiles de Patagonie. Bol. Inst. Geogrl Argentina 15 p. 95, fig. 39, Buenos Aires.
Upper Miocene (Santacruzien) Monte Observacion, Patagonia.
Distal fragment of radium. Assigned to the Anatidae. Dimensions indicate a bird of considerable size.
Lambrecht considers the radius a characterless element and gives the specimens a place with considerable reserve.

Eutelornis patagonica Ameghino 1895
1895. Ameghino pp. 594-595 ("A.A.O"), fig. 40
Upper Miocene (Santa Cruzien) of Monte Observacion, Patagonia.
Distal epiphyse of humerus and proximal end of tibiotarsus

Chenalopex debilis Ameghino 1891
1891 Amerghino: Enumeracion de las Aves fosiles de la Republica Argentina. Rev. Argent. Hist. Nat. p. 441
Pampeano medio (piso-belgranense) of the city of La Plata
Tarsometatarsus (no illus.) diameter maximum trasnvers from one to the other of the trochleae laterales -- 8 mm.

Chenalopex pugil Winge 1888
Winge: Fugle fra Knoglehuler i. Brasilien. E. Museo Lundii 2, pp. 3, 9, 10, 14, 19-22, fig. 1-6, 1888
Andrews, C. W., 1897. On some fossil remains of carinate birds from Central Madagascar. Ibis p. 350
Material: cervical vert., ribs, sternum, pelvis, coracoid, humerus, ulna, radius, metacarpus, phal i of wing, tibia, tarsus.
(Illustrated: coracoid, humerus, metacarpus, tibia, tarsus by Winge) Pleistocene of Lagoa Santa, Brazil.

Santa Cruz = non marine - conformable over Superposition marine beds slightly less than top of Oligocene marine Up. Eo - Up. Mio. (Low. Mio. Simpson)

Beds Deseado = Pyrotherium beds — Up. Cret. — Up. Oligo (Low-Mid Oligo. Simpson)

Beds Casamayor = Notostylops-zone — Up. Cret. - Low. Oligo (Low Eoc. Simpson)

Modern South American birds related to the Eoc. bird?
~~Anseriformes~~ Anseriformes & Phoenicopteridae

Ciconiiformes
Phoenicopteridae
Phoenicopterus ruber -- Atlantic coast of subtropical and tropical America
P. chilensis -- Temperate South America from Peru on west and Uruguay on east to Tierra del Fuego.
Phoenicoparrus andinus -- Chilean Andes and Andes of northwestern Argentian
Ph. jamesi -- Andes of southern Peru, northern Chile and extreme northwest Argentina

ANSERIFORMES
Anhimidae (Screamer)
Anhima cornuta -- greater part of northern tropical So. America (this is the only species of Anhima listed)
Chauna torquata -- Paraguay, so. Brazil north and east Argentina and Uruguay
C. chavaria -- northern Colombia and northern Venezuela (just the 2 species of Chauna listed)

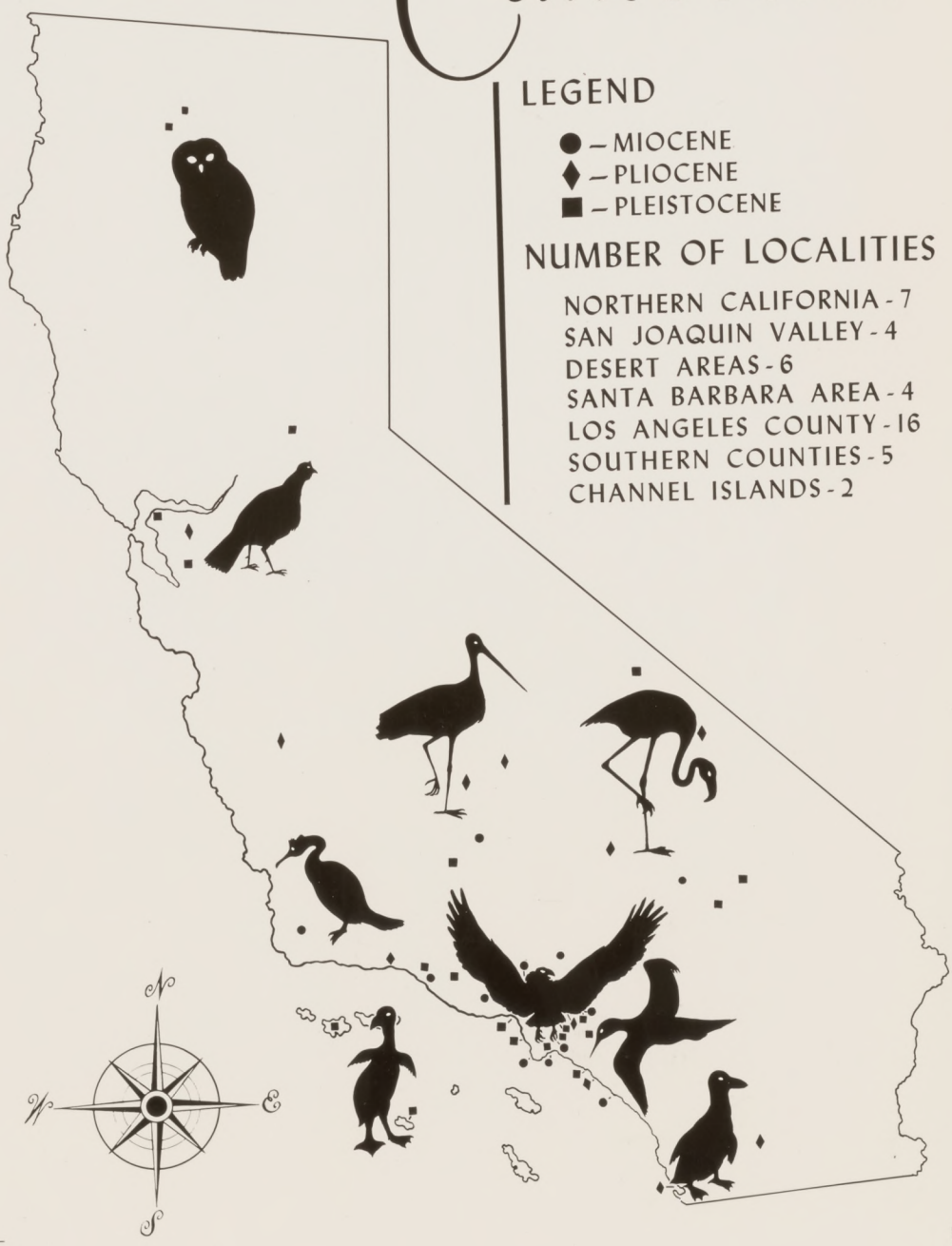
Anatidae
*Cygninae
Cygnus (Sthenelides) melancoriphus -- Paraguay, so. Brazial, Uruguay, Argentina, Chile, Falkland Ids.
Plectropterinae, genera Anseranas and Plectropterus (none in So.Am. these are native of Australia, New Guines and Africa
Cereopsinae, Genus Cereopsis, one in Australia only.
*Anserinae
Chloephaga -- 7 species, all from South America, mostly Chile and Argentina; one from Peru and Bolivia
*Dendrocygninae
Dendrocygna -- 8 species of which the following from So. Amer.
D. viduata -- tropical so. amer. also Africa
D. bicolor -- " " " " "
D. autumnalis -- all xxx Amer. inxexoxepoxdiexcior
*Anatinae
Neochen jubata -- basins of Orinoco and Amazon (only 1 sp. of genus)
Sarkidiornis carunculata -- Venezuela so to north Argentina, Paraguay and so. Brazil (another sp. in Africa and Asia)
Cairina moschata -- Mexico to So. Amer -- coast Peru; Argentina
Coscoroba coscoroba -- Chile, Argentina, Paraguay, Uruguay, Falkland Ids. (just the 1 sp. of the genis)
NOTE: all of the above come before Tadorna. Tadorna is not known in South America, but seems related to Dendrocygninae.
Anas (follows Tadorna, Pseudotadorna andNesonetta none of which is known in So. Amer. Of the genus Anas the following known in S.A.:
A. cyanoptera (Querquedula)
A. (Querquedula) discors
A. leucophrys
A. brasiliensis
A. specularioides
A. specularis
A. versicolor
A. andium
A. flavirostris
A. spinicauda
(The above all occur xxxxxxxxxxx just before Anas(Dafila)acut
A. bahamensis

Anatidae cont'd
Anatinae cont'd
Mareca (follows Anas) In so. Amer.:
M. sibilatrix
Spatula platalea
Heteronetta tricapilla (last one before the Nyrocinae)
*Nyrocinae
Metopiana peposaca
Nyroca erythrophthalma
Tachyeres brachyptera (next after Nyroca) "Steamer Duck"
*Oxyurinae (of 4 genera, 2 known in Sol Amer.) (Erismaturinae)
Nomonyx dominicus
Oxyura ferruginea -- Andean lakes of Peru and Bolivia
O. vittata -- So. S. Amer. from no. Chile to Brazil and Argentina
*Merginae
Mergus octosetaceus
**Merganettinae-- only one genus with 7 sps. all from So. Amer.
Merganetta armata

Charadriiformes
Burhinoidea (follows Dromadoidea which in turn follows Phalaropes)
*Burhinidae -- ~~3 genera,~~ 9 sps, of which only 2 are known in America,
(they range from Mexico to So. Amer.):
Burhinus bistriatus
B. superciliaris "Thick-knees" (other genera Esacus (1 sp.)
and Orthorhamphus(1 sp.)

**Thinocoroidea
Thinocoridae -- 2 genera, 4 sps., all So. Amer.
Attagis and Thinocorus
**Superfamily Chionidoidea
Chionididae -- 1 genus 2 sps. all So. Amer.

LOCALITIES WHERE FOSSIL BIRDS HAVE BEEN FOUND IN *California*



NUMBER OF LOCALITIES

Northern California, 7

San Joaquin Valley, 4

Desert areas, 6

Santa Barbara area, 4

Los Angeles County, ~~16~~ 17

Southern Counties, 5

Channel Islands, 2

The serpent eating Secretary Bird from Africa. This bird is not intimately related to the Walking Eagle of Rancho La Brea but he is the result of a parallel line of development on the part of nature. He is here seen in an alarm pose.

By permission of the New York Zoological Society.
E.R.Sanborn , photographer.

X3 17

DEPARTMENT OF SCIENCE

CALIFORNIA STATE NORMAL SCHOOL

LOS ANGELES

JESSE F. MILLSPAUGH, PRESIDENT

THE BIRDS OF RANCHO LA BREA

By

Hildegarde Howard

Rancho La Brea is one of the few fossil localities in the world in which bird bones have been preserved in large numbers. The avian skeleton being exceedingly fragile, ~~the individual~~ bones are usually broken ~~or crushed~~ in the process of entombment. The soft tar of the brea deposits, with its high preservative qualities, was therefore an exceptionally favorable repository for avian remains. Furthermore, as these beds accumulated during the Pleistocene epoch, which followed the last of the great periods of upheaval of the earth's surface, there has been no tremendous pressure or fracturing of the deposits, which in older accumulations so frequently affects the entombed remains.

The Los Angeles County Museum collection of fossil bird ~~bones~~ from Rancho La Brea numbers approximately 100,000 ~~specimens~~ Bones. These have been taken from about twenty different excavations, or "pits," ~~at Rancho La Brea~~. Smaller collections from another five excavations are located ~~at the University of California, Occidental College, and Los Angeles High School~~ in other institutions. ~~Nearly all~~ Most of the ~~traps~~ were active only in the Pleistocene epoch and are placed at 50,000 to 100,000 years in age. In a few excepted instances, however, the fauna more closely resembles that of today, and it is likely that the animals in these ~~sites~~ were trapped within Recent time. The discussion which follows ~~is~~ concerned ~~only~~ with the true Pleistocene deposits, and the figures given pertain to the counts ~~which have been~~ made on ~~the~~ specimens in the Los Angeles Museum collection. ~~Those of the other institutions have not yet been studied in detail.~~

Though tar is an excellent preservative of bone, it does not prevent the disintegration of the soft parts of the body. Consequently the bones of the ~~skeletons~~ animals entombed at Rancho La Brea became separated, and the gradual movement of gases in the tar tended to scatter the skeletal parts, ~~of the animals~~. ~~For the most part dissociated bones of the various species of birds and mammals were found mixed together.~~ In spite of the ~~separation of the elements of the skeleton,~~ scattering however, it has been possible, after sorting and studying the specimens, to estimate the number of individuals ~~birds~~ which met their death in the tar traps. At least 4300 birds are represented in the collections at the Los Angeles County Museum, ~~and it is probable that the figure will be increased as research continues~~. Approximately 115 species ~~of birds~~ have been recorded from these asphalt deposits. Some of these are illustrated in the accompanying chart which portrays the relative abundance of the twelve avian orders which are represented.

Although many birds met their death in careless wandering, or by alighting upon a superficial covering of water, a greater number were undoubtedly actually attracted to the scene by the presence of other creatures already mired. This fact has led to the unusual preponderance of flesh-eating forms found in the deposits. Two-thirds of the birds taken from the asphalt are of raptorial species: vultures, eagles, hawks, falcons and owls, ~~included in the orders Falconiformes and Strigiformes.~~ (Falconiformes)

Outstanding among the birds which seek their prey by day was Teratornis, the great condor-like bird with massive body and head, and a wingspread estimated at twelve feet. Over a hundred individual birds of this species are represented in the bones from the asphalt. Two true condors were present, smaller than Teratornis, yet as large as any living bird of flight. One of these, (Breagyps clarki Miller) represented by only

twenty individuals, is now extinct, the other is identical with the living California Condor and indicates the presence of this now exceedingly rare bird, in considerable numbers (over 200) in the Los Angeles area in prehistoric time. Four small forms, totalling about 600 birds, complete the list of carrion-feeding raptores. It is an interesting fact that only twenty of the 600 can be assigned to the now common Turkey Vulture, while an extinct species (Coragyps occidentalis (Miller)) of the same family, the New World Vultures (Cathartidae), occurs in abundance (200 individuals). The remaining two small forms, though carrion feeders, are only remotely allied with the cathartid vultures. The American Neophron (Neophrontops americanus Miller) is unmistakably related to vultures of the Old World (subfamily Aegypiinae of the family Accipitridae), while the La Brea Caracara (Polyborus prelutosus Howard) is a member of the falcon family.

Bones of eagles occurred in great abundance in the pits, while today there are but two species known in the United States, there were seven in the Los Angeles area in the Pleistocene. Two of these, the Golden Eagle and the Bald Eagle, have continued on into the Recent, the other five have disappeared. The Golden Eagle was the most abundantly represented of all birds in the deposits, with 890 individuals; over 150 Bald Eagles were counted, and slightly smaller representations of the extinct Grinnell Eagle (Spizaëtus grinnelli (Miller)), the Fragile Eagle (Buteogallus fragilis (Miller)), and Errant Eagle (Neogyps errans Miller). The latter bird, like the American Neophron, shows relationship with the Old World Vultures, but the stronger beak and feet indicate that the bird was capable of preying on live animals. The large Woodward Eagle (Morphnus woodwardi Miller) and the long-legged Daggett Eagle (Wetmoregyps daggetti (Miller)) were more rare, with about 20 individuals of the former, and only 6 of the latter found in only two pits.

The smaller birds of prey ~~occurred in less abundance~~ than the eagles and condors. The total number of individuals representing 9 ~~species of~~ hawks, a kite, 5 falcons and 9 owls, is only 675 (1000 less than the count of the birds of greater size). Of these only one species, the Brea Owl (Strix brea Howard) is definitely extinct.

were less numerous ~~fewer numbers~~

Occurring in less abundance than the eagles and condors were the smaller birds of prey, the hawks and falcons, and the owls (order Strigiformes). All of these birds combined total only 675 individuals which is 1000 less than the count of the birds of greater size. ~~In point of number of species, however, they exceed the larger forms.~~ One kite and nine hawks ~~which~~ are represented, of which only one is possibly distinct from forms known today; the same is true of the five recorded falcons. A single extinct owl (Strix brea Howard), and eight species similar to ~~the~~ owls living today, comprise the group of nocturnal raptores.

Among the non-predatory forms, the group of fowl-like birds (order Galliformes) is best represented in point of number of individuals. However, only two species are included, the quail and the extinct California Turkey (Parapavo californicus (Miller)). Slightly over a hundred ~~individual~~ quail are indicated. The turkey was five times as numerous and at least 150 young chicks are included in the count. Clearly the turkey was a resident of this area ~~some fifty to a hundred~~ a few thousand years ago, a fact which suggests the presence of a good growth of brush and trees in the immediate vicinity of the tar traps at that time.

Next in abundance to the fowls are the perching, or song birds (order Passeriformes). At least ~~three hundred and seventy~~ 370 individuals are indicated by well-preserved wing and leg elements and a few skulls of these small forms. ~~In addition to~~ with the exception of one extinct, heavy-beaked blackbird, the recorded species are all similar to forms living today, though in several instances, not in this immediate vicinity. These include: ~~species of~~ kingbird, horned lark, 2 jays, magpie, 2 crows, 2 ravens, chickadee, thrashers, ~~Robin~~, bluebird, waxwing, shrike, meadowlark, blackbirds, oriole, siskin, goldfinch, and several sparrows. Associated with the perching birds in general tree-dwelling habits, are the woodpeckers (order Piciformes) and the pigeons and doves (order Columbiformes). Each of these groups ~~not~~ only three species recorded for each of these groups

is represented by three species, and is known from comparatively few specimens. The Flicker, Lewis Woodpecker and Pileated Woodpecker represent the Piciformes, with a total of 20 individuals. The Columbiformes (totalling about ~~thirty~~ 30 birds) include not only the Mourning Dove and Band-tailed Pigeon, but a few bones of the now extinct Passenger Pigeon.

The ground-dwelling Roadrunner is the sole representative of the cuckoo group (Cuculiformes), and about 16 birds are indicated by the skeletal elements in the collection. (only 8 per cent of the entire avifauna)

A small assemblage of birds associated with water indicates the presence of small, probably seasonal, ponds or marshes in the area during the Pleistocene. ~~The~~ Diving birds are limited to two species (order Colymbiformes) of grebes (known from a single bone each), and two species of diving ducks (order Anseriformes) represented by four or five bones, but probably indicating ~~but~~ one individual of each. Five or six species of surface-feeding ducks (~~mallard, gadwall, two teals, spoonbill, and probably baldpate~~), a swan, and four or five species of geese (including the extinct Pigmy Goose, Anabernicula minuscula Wetmore), complete the assemblage of Anseriformes, which totals close to 180 individual birds. Strangely, the coot (order Gruiformes), commonly associated in ponds and marshes today with the surface-feeding ducks, is represented by only one bone.

Eleven species of shorebirds (Charadriiformes) have been identified, each with a small individual representation, and less than a hundred birds for the whole order. The species included are all similar to those still to be found in the marshes of the Los Angeles area today: Killdeer, Black-bellied Plover, Wilson Snipe, Long-billed and Hudsonian Curlews, Greater Yellowlegs, Long-billed Dowitcher, Marbled(?) Godwit, Avocet and two gulls, probably the Short-billed and the Kittiwake.

For Pamphlet Series

Free paper

Slight differences in species content of the several Pleistocene deposits may be partially attributable to difference in time of deposition, though immediate ecologic conditions undoubtedly played an important part. For example most of the waterbirds were found in two pits. ← no paragraph →

Even less numerous than the shorebirds are the nine species of herons and ibises (order Ciconiiformes) which cannot be distinguished from birds living today: (Great Blue Heron, American Egret, Anthony Green Heron, Night Heron, Bittern, Glossy Ibis and possibly the Little Blue Heron and Spoonbill). In addition to these familiar birds, there are two extinct species of Ciconiiformes, a wood ibis (Mycteria wetmorei Howard), of larger size and straighter beak than the living species, and a true stork of large size (Ciconia maltha Miller). At least thirty individual storks were entrapped in the Pleistocene tar of Rancho La Brea. Several of the bones of this species are incompletely ossified, indicating immaturity, but all are well past the nestling stage there is no evidence of the bird having actually bred in the vicinity. (The chart indicates a total of 53 birds of the order Ciconiiformes; since its drawing, however, another ten individuals have been added so that number now exceeds 60, of which half are storks.)

Of the 33 cranes which are estimated to have been mired in the tar, there are at least two Whooping Cranes. The other 31 individuals belong to the species Grus canadensis, and represent two races, the Sandhill Crane and the Little Brown Crane.

The fortunate circumstance of the occurrence of these tar seeps scattered over a space of some 23 acres, provides an unusually full record of the locality. This, no doubt, in large measure accounts for the number of avian species represented, for in no one excavation were all species found. Even the pit most productive of avian remains, in which approximately 1600 birds became mired, yielded only 81 of the 115 species known from the entire area. Possibly time of deposition may account in some degree for the slight differences which are noted in the Pleistocene deposits, but immediate ecologic conditions undoubtedly played an important part. For example, most of the ducks and shorebirds were found in two deposits.

In the other excavations, they waterbirds were scantily represented or were absent entirely. This offers the suggestion that there were a few localized sites of marshy ground or small ponds. The presence of the occurrence of the rare Daggett Eagle in only two pits is a curious fact which may be associated with time, but, on the other hand, could be explained by the presence of a favored type of tree.

In spite of the small distinctions between the various Pleistocene pits, the avifauna as a whole suggests the same general period of deposition and is in marked contrast with that of the few asphalt deposits which accumulated within the Recent epoch (presumably within the last 10,000 to 100 years). In these later sites not only have the extinct forms diminished, or disappeared, but the existent species indicate the occurrence of geologic changes. Species associated with the brushlands and trees have diminished in numbers, as grassland types have increased. Meadowlarks and burrowing owls, for example, known from only 10 to 15 individuals in any one of the typical Pleistocene tar seeps, increase to 70 (meadowlarks) and over a hundred (owls) in one of the Recent deposits. The occurrence of these Recent assemblages, accumulated in the same manner as the more ancient deposits, provides an important means of comparison of the area in its natural state in two geologic epochs.

The Pleistocene stands out as a period of greater abundance of large birds, as well as mammals. Most outstanding, among the birds, of course, are the numerous eagles and condor-like birds. Even among the non-raptores, the turkey and stork are noteworthy examples of birds of large size, once characteristic of the Los Angeles area.

Of the 115 species of birds recognized, 16 are now extinct, and another thirty per cent have disappeared locally. Closest living relatives of the extinct types, for the most part, are found today in more southerly parts of the Americas, though in two instances relationship with Old World forms is indicated, and in the case of Teratornis, the family is now unknown anywhere in the world. As the Pleistocene epoch stands so close to our own in time, there is little or no indication that any of the fossil species known from that time, are ancestral to birds of today. On the contrary, many Recent species were already in existence in the Pleistocene and have carried over into our time, while certain of their Pleistocene contemporaries, less able to adapt to changing conditions are those now listed as extinct.

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recorded species are all similar to forms living today, though, in several instances, not in this immediate vicinity. The 25 species are listed below:

Kingbird (Tyrannus sp.)
Horned Lark (Otocoris alpestris)
Steller Jay (Cyanocitta stelleri)
California Jay (Aphelocoma californica)
Yellow-billed Magpie (Pica nuttalli)
American Raven (Corvus corax)
White-necked Raven (Corvus cryptoleucus)
Western Crow (Corvus brachyrhynchus)
Northwest Crow (Corvus caurinus)
Chickadae (Penthestes sp.)
California Thrasher (Toxostoma redivivum)
Sage Thrasher (Oreoscoptes montanus)
Bluebird (Sialia sp.)
Cedar Waxwing (Bombycilla cedrorum)
Loggerhead Shrike (Lanius ludovicianus)
Yellow-headed Blackbird ? (Xanthocephalus sp.)
Red-winged Blackbird (Agelaius sp.)
Western Meadowlark (Sturnella neglecta)
Oriole (Icterus sp.)
Pine Siskin (Spinus pinus)
Goldfinch (Spinus tristis)
Brown Towhee (Pipilo fuscus)
Black-throated Sparrow (Amphispiza bilineata)
Bell Sparrow (Amphispiza belli)
Chipping Sparrow (Spizella passerina)

The presence of still other passerine bones which cannot be specifically determined, give evidence of the occurrence of a number of other species, probably including some of the finches and warblers.

Associated with the perching birds in general tree-dwelling habits are the woodpeckers (Order Piciformes) and the pigeons and doves (Order Columbiformes). Each of these groups is represented by three species at Rancho La Brea, but is known from comparatively few specimens. The Red-shafted Flicker (Colaptes cafer), Lewis Woodpecker (Asyndesmus lewisi), and the Pileated Woodpecker (Ceophloeus pileatus) represented the Picifomres, with a total of only a few individuals. Of these, the Flicker was most numerous, probably because of greater opportunity for the entrapment of this ground-feeding bird. The Pileated Woodpecker, a bird of the coniferous forests today, was probably only a stray to the region. One of the Hairy Woodpecker group (Dryobates) occurred in some numbers in the more sylvan environment of the Carpinteria locality, but was absent at Rancho La Brea.

CALIFORNIA'S PREHISTORIC BIRDS

WHAT RECORDS HAVE WE?

Skeletons 1 site Pleisto
Footprints (rare) 2 sites Plio
Feathers (rare) Mio. and La Brea
Eggs

HOW ARE ANCIENT BIRDS PRESERVED?

Must be buried to be protected from air
Marine beds best Mio, Plio, Pleisto
Lake beds good (also river)
Volcanic ash (Ricardo)
Cave deposits
Quicksand and tar traps
(no quicksand in California)

SHOW SLIDES

1. Marine -- Tepusquet Canyon
   Miocene
2. Lake -- Manix
   Pleistocene
3. Shore -- Copper Canyon
   Pliocene
4. Copper Canyon
5. " " footprints, shorebird
6. " " " , crane

More Slides OVER

7. Tar entrapment -- La Brea Pleistocene --
8. Same -- with bird entraped
9. Bones in pit

End of Slides

Miocene

MIOCENE sea over much of southern Calif.

BIRDS OF THE MIOCENE in CALIFORNIA

Sea

13 localities (all in southern Calif.)

of these 11 are marine

30
~~29~~ species of birds -- all extinct

~~5 or~~ 6 extinct genera

1 extinct order and family

~~2~~ more extinct families (Pasiornithidae Paleolodidae)

Represent 10 orders and 14 families

Most outstanding is
OSTEODONTORNIS
Extinct order between Albatrosses and Pelecans
Describe
16 inch skull --"toothed"
14-16 feet wingspread
primary feathers impressed
Remarkable to find so much
Calif. rich in Miocene shales that preserve well
Tepusquet, Calabasas, Lompoc
Lomita and San Pedro

SLIDES

10. Osteodontornis complete
11. Osteodontornis skull
12. Puffinus diatomicus
13. Phalacrocorax femoralis

END of Slides

OVER

Other Miocene birds

Procellariiformes

Albatross -- wing bones

Shearwaters -- three or more

P. diatomicus

P. inceptor (larger)

P. sp.

new ones from Vent. and Tepus.

Petrel from Capistrano has large feet

Pelecaniformes

Boobies and gannets 4 of modern genera and 1 extinct genus with less ability to fly than sulids today (larger legs, smaller wings)

Cormorant shown (Brandt size)

Anseriformes

6 ducks and 1 goose (new genus)

Flamingo

1 of extinct family, shorter legs.

Gruiformes

Rallidae toe bones

Charadriiformes

Godwit and gull, murrelet

Land birds

Quail and 3 hawks (1 ext.genus)

Passerine (extinct genus)

PLIOCENE -- still ocens here

PLIOCENE BIRDS in CALIFORNIA

10 localities
20 species -- all extinct
2 extinct genera
1 extinct family (Mancallidae)

First fossil bird found in Calif.
was Pliocene -- 3rd st. L.A

San Diego beds rich -- suggest
a lagoon and loafing ground

LOONS AND GREBES
2 loons, 2 grebes
Procellariiformes
2 shearwaters
Pelecaniformes
1 cormorant
1 sulid (ext. genus of Miocene)
even smaller wings than "
Anseriformes
1 duck, 2 geese (1 is a footprint)
Charadriiformes
Mancallidae, auklet, shorebirds
(at San Diego and Cooper Canyon)
OWL -- Extinct genus Lechusa
Passerine -- unidentified

To Pleistocene
before slides

76.9
48 s
28, 4

to cal Dock
3, 26, 57

PLEISTOCENE BIRDS OF CALIFORNIA

Marine deposits 10
Lake or land 12

188 species of which 32 extinct
10 genera extinct, 1 family
many land birds owing to the
3 tar deposits

Marine birds
Most interesting, CHENDYTES (2 sps.)
Many leg bones found at first
A large, flightless scoter
Two species (one older seems
less degenerate in wings)
Only 4 extinct species in marinedeps
Gannet and cormorant and Chendytes

Land birds
Many living today represented,
but larger raptores

AVIFAUNA OF TODAY PRESENT BUT OTHERS
MORE DOMINANT.

SLIDES
14. -15. Mancalla mount
16. Mancalla and Chendytes
17. Femora Chendytes and Scoter
18. Humeri " " "
19. Scoter bones
20 -21 Chendytes bones

more OVER

LA BREA

22. Teratornis
23. Neogyps
24. Caracara and Parapavo
25. Stork
26. Chart

Wetmore gives 16 sps.

* = extinct genus

3.1.57

(12 of these, there are 9 sps., not definite) added this 6 & 58

MIOCENE BIRDS IN CALIFORNIA - 30 - 29

Puffinus diatomicus (Lompoc) + San Pedro
Diomedea, sp. (Lomita) wing bones
Oceanodroma hubbsi (Orange Co.)
*(Paleo Sula) stocktoni (Lomita + El Sereno)
Phalacrocorax femoralis (Calabasas)
Sula willetti (Lompoc)
*Miosula media "
Moris vagabundus (Sharktooth Hill)
Moris lompocana (Lompoc)
Sula pohli (San Fernando Valley)
*Megapaloelodus connectens (Barstow)

Puffinus inceptor (Sharktooth Hill)
Puffinus sp. " "

2 + 3 waterbirds
5 land "

6 Ducks, 6 sps. (Barstow)
*Presbychen abavus (Sharktooth Hill)
Rallidae (Point Fermin)

17 def. ext

2 Buteo sp. (2 sps.) (Barstow)
*Miohierax stocki (Vasquez Canyon)

Cyrtonyx tedfordi (Barstow)

Limosa vanrossemi (Lompoc)
Gull, sp. (Barstow)
Cerorhinca dubia (Lompoc)

*Osteodontornis orri (Tepusquet Canyon)
*Passerine to be described " " " = Paleoscinis tardirostris

Wetmore gives 14 sps.

PLIOCENE BIRDS OF CALIFORNIA

~~18~~ 19 ~~19~~ 20 23 (Of these, there are 6 sps., not definite)

1 * = extinct genus

Gavia concinna (Monterey Co. and San Diego)
Gavia howardae (San Diego)

Colymbus parvus (Kern Co., + S.D.)
~~Gr~~obe, sp. (San Diego)
Puffinus kanakoffi (San Diego)
Puffinus felthami (Corona del Mar)

Phalacrocorax kennelli (San Diego)
Miosula recentior (San Diego
Duck (Anza desert)
Branta howardae (Ricardo)
Anserine, sp. (Moraga Valley)
Grus conferta (Contra Costa Co.)
Sarcoramphus kernensis (Kern River)
Parabuteo, sp. (Kern River)

*Mancalla californiensis (3 locs.) 2 q.v.
Mancalla diegense (San Diego)
Brachyramphus pliocenus (San Diego)
Shorebird? (San Diego)
*Lechusa stirtoni (San Diego) (Owl)

19 + 16 waterbirds

17 def. extinct

	land	water	all sps.
Plio	110	77	187
Mio	4	24	29
Plio	2	16	18
	116	117	234

Passerine (Anza desert)
Ptychoramphus tenuis (San Diego)
Sula humeralis (San Diego)
Colymbus subfarvus (San Diego)
(Wader foot prints (2 sps.) Copper Canyon

Passeriformes 53 - 3

Tyrannus
Otocoris alpestris
Petrochelidon albiforns
Sayornis
Empidonax
Cyanocitta stelleri
Aphelocoma californica
Pica nuttalii
Corvus corax
Corvus cryptoleucus
Corvus brachyrhynchos
Corvus caurinus
Penthestes sp
Sitta canadensis
Sitta pygmaea
Chamaea fasciata
Heleodytes
Toxostoma bendirei
Toxostoma redivivum
Oreoscoptes montanus
Turdus migratorius
Hylocichla
Sialia mexicana
Regulus
Bombycilla cedrorum
Lanius ludovicianus
Xanthocephalus
Agelaius
Sturnella neglecta
Euphagus cyanocephalus
Euphagus magnirostris
Pandanaris convexa
Carpodacus mexicanus
Spinus pinus
Spinus tristis
Loxia curvirostra
Pipilo maculatus
Pipilo fuscus
Pipilo angelensis
Amphispiza bilineata
Amphispiza belli
Spizella passerina
Passerella iliaca
Chordeiles acutipenis not listed by Wetmore
Chordeiles sp.
Phalaenoptilus nuttalli — Caprimulgiformes - not listed by Wetmore from Calif.
Phe[illegible]cticus melanocephalus
Hesperiphona vespertina
Pooecetes gramineus
Zonothrichia leucophrys
Melospiza melodia
Chondestes grammacus

~~Phyllocticus melanocephalus added 3.1.57~~

Pleistocene birds of Californai, continued

Charadriiformes 19 — 0

- Eupoda montana
- ~~Oxyechus~~ vociferus charadrius
- Squatarola squatarola
- Capella ~~delicata~~ gallinago
- Totanus melanoleucus
- Numernis americanus
- ~~Phaeopus~~ hudsonicus = Numenius phaeopus
- ~~Pelidna~~ alpina Erolia
- Limnodromus griseus
- ~~Re~~curvirostra americana
- Limosa fedoa not listed by Wetmore
- ~~R~~issa tridactyla not listed by Wetmore
- Larus glaucescens
- Larus brachyrhynchus not listed by Wetmore
- Uria aalge
- ~~Syn~~thliboramphus antiquus
- ~~Phalarope~~
- Ptychoramphus aleuticum
- ~~Stercorarius sp.~~

Columbiformes 3 — 1

- Columba fasciata
- Zenaidura macroura
- ☆ Ectopistes migratorius

Cuculiformes 1

- Geococcyx californianus

Strigiformes 11 — 2

- Tyto alba
- Otus asio
- ~~O~~tus flammeolus
- ☆ Bubo sinclairi
- Bubo virginian s
- Glaucidium gnoma
- Speotyto cunicularia
- ☆ Strix brea
- Asio ~~wilsonianus~~ otus
- Asio flammeus
- ~~Cryptoglaux~~ acadica Aegolius

Piciformes 4 — 0

- ~~Co~~laptes cafer
- ~~Ceophloeus~~ pileatus Dryocopus
- Asyndesmus lewisi
- Dryobates (Sphyrapicus)

2	1	53	
1	3	4	
4	5	11	
2	4	1	
15	13	3	
2	24	19	
1	34	4	
2	4	4	
3	4	33	
32	16	24	
	3	13	
	1	5	
	11	5	
	4	4	
	52	2	
	173	184	
	18		
	27		
	218		
	3		
	221		
	1		
	220		

173
2
175
+ 2
177
45
222

Anseriformes continued — 2

Nyroca valisineria
~~Charitonetta~~ albeola
Melanitta perspicillata
Chendytes lawi
Chendytes milleri
Melanitta deglandi
~~Erismatura~~ jamaicensis

Falconiformes 33 — 15

Cathartes aura
Coragyps occidentalis
~~Gymnogyps californianus~~
Gymnogyps amplus
Breagyps clarki
Teratornis merriami
Cathartornis gracilis
Neogyps errans
Neophrontops americansu
Elanus leucurus
Astur atricapillus
Accipiter striatus velox
Accipiter cooperii
Buteo jamaicensis
Buteo lineatus
Buteo swainsoni
Buteo lagopus
Buteo regalis
Buteo sp.
Hypomorphnus milleri
Hypomorphnus fragilis
Wetmoregyps daggetti
Morphnus woodwardi
Spizaetus grinnelli
~~Spizaetus willetti~~
Aquila chrysaëtos
Haliaeëtus leucocephalsu
Circus hudsonius
~~Polyborus~~ prelutosus

Falco mexicanus
Falco swarthi
Falco peregrinus
Falco columbarius
Falco sparverius

Galliformes 6 — 2

Dendragapus obscurus
Bonasa umbellus
Lophortyx californica
Oreortyx picta
Meleagris richmondi
Parapavo californicus

Gruiformes 4 — 0

Grus americana
Grus canadensis
Rallus limicola
Fulica americana

✓ recorded in 1942 by Miller — recd 1942 but sp. not certain

Pleistocene Birds in California — 188 (9 Pleist, 28 sp not dfnt

Wetmore gives 158 sps.

2 — 0 extinct

Loons
✓ Gavia immer
~~✓~~ Gavia arctica

4 — 0

Grebes
✓ Aechmophorus occidentalis
~~✓~~ Colymbus, ~~spx~~ nigricollis
✓ Podilymbus podiceps
Colymbus auritus ?

5 — 2

Pelecaniformes
✓ Pelecanus erythrorhynchos
✓ Phalacrocorax auritus
✓ Phalacrocorax penicillatus
✓ ☆ Moris reyana
✓ ☆ Phalacrocorax rogersi
Pelecanus occidentalis (carp.)

5 — 0

Procellariiformes
✓ Diomedea sp.
✓ Diomedea albatrus
✓ Puffinus griseus
✓ Puffinus opisthomelas
✓ Fulmarus glacialis
~~☆ Oceanodroma hubbsi~~

77 waterbirds

13 — 7

Ciconiiformes
✓ Ardea herodias
✓ Casmerodias albus
✓ Egretta thula not listed by Wetmore
✓ Florida caerulea " " " "
✓ Butorides virescens
✓ Nycticorax nycticorax
✓ Botaurus lentiginosus
✓ ☆ Ciconia maltha
✓ ☆ Mycteria wetmorei
✓ Plegadis guarauna
✓ Ajaia ajaja
☆ Phoenicopterus copei ?
☆ Phoenicopterus minutus

Dagged
13
20 "

2Y — 2

Anseriformes
✓ Cygnus columbianus
✓ Branta canadensis
✓ ☆ Branta dickeyi
✓ ☆ Anabernicula minuscula
Branta nigricans not listed by Wetmore
✓ Anser albifrons
✓ Chen hyperborea
✓ Chen rossi
✓ Anas platyrhynchos
✓ ~~Chaulelasmus~~ Anas streperus
✓ Mareca americana
✓ Anas Dafila acuta not listed by Wet.
✓ ~~Nettion~~ Anas carolinense
✓ Anas cyanoptera
✓ Spatula clypeata
✓ Nyroca americana
✓ Nyroca affinis (not listed by Wetmore)

sp uncertain
16 + 187 Pleist
12 29 Mio
4 15 Plio
32 233
− 32
201

158
16
14
188 Wetmores list
9 Calif. sps

Civian fossil spps, from various southern Calif. locs.

Pt San Diego ||||| ||||| || 7

+ San Pedro ||||| ||||| ||||| ||||| ||||| || 27

X Newport ||||| ||| 8

P ~~Kern Co, Cal~~ Kern Co Pyramid Hills (1969) 1

X Del Rey ||||| || +3 10

+ Manix ||||| || 7

X + tarjeta ||||| ||||| ||||| ||||| |||||

Localities where fossil birds have been found in Calif. 46 ✓ = known in 1982 = 29

Los Angeles area 14
- ✓ San Pedro (city area) Ps
- ✓ San Pedro breakwater (M)
- ✓ Lomita (M and Ps)
- ✓ Point Fermin M
- ✓ Bixby Slough (Vermont Ave. and 101) Ps
- ✓ Rancho La Brea Ps
- ✓ Playa del Rey (Lincoln Blvd. and Jefferson) Ps
- ✓ Santa Monica Ps
- ✓ 3rd St., L.A. (tunnel) Pl
- ✓ Workman and Alhambra Sts Ps
- ✓ El Sereno (M)
- ✓ La Habra (Imperial Highway) Ps

North of L.A. 5
- ✓ Calabasas M
- ✓ Tapo Canyon M
- ✓ Carpinteria Ps
- ✓ Sexton Canyon, Ventura County Ps
- ✓ Santa Barbara Pl
- ✓ Lompoc M

San Joaquin Valley 5
- ✓ McKittrick Ps
- ✓ Ricardo Pl
- ✓ Bakersfield (Sharktooth Hill) M
- ✓ ✓ Kern County (x 2 sites) Pl, Pl

Mohave Desert and enroute 4
- ✓ Barstow M
- ✓ Manix Lake Ps
- ☆ Schuiling Cave, Newberry Ps
- ☆ Vasquez Canyon M

Far north 3
- ✓ Shasta County -- Samwel and Potter Creek Caves on McCloud River) Ps
- ✓ Hawver Cave (on American River near Auburn) Ps

Middle 4
- ✓ Rodeo (east shore S.F. Baynorth of Pt. Richmond) Ps
- ✓ Mission San Jose (Niles Canyon) Ps
- ✓ KingCity, Monterey Co. Pl
- ✓ Morago Valley, Contra Costa Co. Pl

South of L.A. 4
- ☆ Newport Bay mesas Ps
- ☆ Road inland from Corona del Mar Pl
- ✓ San Diego Pl
- ☆ Capistrano Beach M

Islands 2
- ☆ Santa Rosa Id. Ps
- ☆ San Nicolas Id. Ps

Eyerdell Illustrations
- San Diego area — Mancalla
- Newport and other coast site - Chendytes
- L.A. City area, Teratornis,
- Manix area, Flamingo (drawn in lake?)
- McKittrick — stork
- Carpinteria, stilt eagle

From Lambrecht p. 58

Fossil bird remains live in the literature for hundreds of years. The first -- withal phantastically high-sounding -- discovery mentions Albert the Great, 1205-1280, who relates "that one has found a branch of a tree a bird nest containing birds was found, all of which were petrified." (Cited by O.C.Marsh, 1880). Four hundred years later Johann Jakob Scheuchzer (1672-1733) mentions in his "Piscium quaerele et vindiciae" a feather impression from the Mollasse (Tertiary sandstone) of Oeningen. The bird nest can stem from a limestone ~~which~~ the nest of the Stuttgarter Museum illustrated in this handbuch, also ~~the~~ actual feather impression ~~from Oeningen.~~ comes before us out of Oeningen.
The first two accounts concerning alleged fossil bird remains are therefore not products of phantasy -- they actually apply to fossil or subfossil remains of birds.

In the later literature, however, phantastic interpretations appear. So have, for example, Klein (1778), Bredetzky (1805), Zipser (1817) and Fichtel (1780) listed shark teeth as bird tongues and bird beaks. Kralowansky, who systematically grouped the unearthed animals, named the fossil bird remains "Ornitholiti Petrefactae auium." (1795)

Then followed accounts concerning birds changed to salt (Benko and Fridvaldsky, 1767, 1778)and from this time on several"petrified birds" were mentioned.

RECOMMENDED RERERENCE LITERATURE

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(5) Rancho La Brea. A Record of Pleistocene Life, by Chester Stock. Los Angeles County Museum Science Series No. 15, Paleontology publ. no. 9, 1953. (pp. 54–66, birds).

(3) ~~American Ornithologists Union~~ Check-List of Fossil Birds of North America, by Alexander Wetmore. Smithsonian publ. no. 3587. (Note: a new edition of the fossil checklist will ~~xxxx~~ be published in 1955 or 1956.)

(1) The Origin of Birds, by Gerhard Heilmann, London, J. F. and G. Witherby, 208 pp., 1926.

Smith. Misc. Coll. vol. 99, No. 4, 1940

Eudyptes on p. 39

LOS ANGELES COUNTY MUSEUM SCIENCE SERIES

No. 2. Quaternary Antelope Remains

copy from Shell handbook, omitting No. 10, and add the following

No. 17. Fossil Birds, by HILDEGARDE HOWARD, Paleontology publ. No. 10, 40 pp., 21 figs., 1955. (Supersedes No. 10 which is out of print).

today is but a continuation of the more adaptable Pleistocene types, shifted about geographically to accommodate to changing local conditions.

Tomorrow's scene will again hold a slightly different aspect, for nature is never static. So slowly does she work, however, that changes undergone within our lifetime are scarcely apparent. Only as we are granted the privilege of viewing the distant past, can we begin to discern the effect of these changes and derive some vision of what lies ahead.

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MIOCENE

Diomedea sp.
Puffinus diatomicus
Puffinus inceptor
Puffinus priscus NEW
Puffinus mitchelli NEW
Oceanodroma hubbsi
Osteodontornis orri
Paleosula stocktoni
Sula willetti
~~Sula humerella~~
Sula phhli
Moris lompocana
Moris vagabundus
Miosula media
Phalacrocorax femoralis
Megapaloelodus connectens
Presbychen abavus

PLIOCENE

Gavia concinna
Gavia howardae
Colymbus parvus
Colymbus subparvus
Puffinus kanakoffi
Puffinus felthami
Sula humeralis
Miosula recentior
Phalacrocorax kennelli
Anserine, sp. (footprint)
Branta howardae

PLEISTOCENE

Gavia immer
Gavia arctica
Gavia stellata
Colymbus caspicus
Colymbus auritus?
Aechmophorus occidentalis
Aechmophorus lucasi
Podilymbus podiceps
Diomedea albatrus
Diomedea nigripes ?
Puffinus griseus
Puffinus p. opisthomelas
Fulmarus glacialis
Pelecanus erythrorhynchos
Pelecanus occidentalis
Phalacrocorax auritus
Phalacrocorax penicillatus
Phalacrocorax rogersi
Ardea herodias
Casmerodius albus
Leucophoyx thula?
Florida caerulea
Butorides virescens
Nycticorax nycticorax
Botaurus lentiginosus
Ciconia maltha
Mycteria wetmorei
Plegadis chihi
Ajaia ajaja
Phoenicopterus minutus
Phoenicopterus copei?
Olor columbianus
Branta canadensis
Branta dickeyi
Branta nigricans?
Anabernicula minuscula
Anser albifrons
Chen hyperborea
Chen rossi?

Duck, sp.
Duck, sp.
Duck, sp. 6 dif. sps.
Duck, sp. Barstow
Duck, sp.
Duck, sp.

Goose, sp. (Shaubtooth Hill)

Sarcoramphus kernense

Parabuteo, sp.

Buteo, sp.
Buteo, sp.
Miohierax stocki

Anas platyrhyncuos
Anas s trepera
Anas acuta
Anas carolinensis
Anas cyanoptera
Mareca americana
Spatula clypeata
Histrionicus histrionicus
Aythya americana
Aythya valisineria?
Aythya affinis
Bucephala albeola
Melanitta deglandi
Melanitta perspicillata
Chendytes lawi
Chendytes milleri
Oxyura jamaicensis
Mergus merganser
Cathartes aura
Coragyps occidentalis
Gymnogyps californianus a plus
Breagyps clarki
Teratornis merriami
Teratornis incredibilis
Cathartornis gracilis
Neogyps errans
Neophrontops americanus
Elanus leucurus
Accipiter gentilis
Accipiter s. velox
Accipiter cooperii
Buteo jamaicensis
Buteo lineatus
Buteo swainsoni
Buteo lagopus
Buteo regalis
Buteo, sp. (new?)
Hypomorphnus sodalis
Buteogallus milleri
Buteogallus fragilis
Wetmoregyps daggetti
Morphnus woodwardi
Spizaetus grinnelli

		Aquila chrysaetos
		Haliaeetus leucocephalus
		Circus cyaneus
		Caracara prelutosus
		Falco mexicanus
		Falco swarthi
		Falco peregrinus
		Falco columbarius
		Falco sparverius
		Dendragapus obscurus
		Bonasa umbellus
		Lophortyx californica
Cyrtonyx tedfordi		Oreortyx pictus
		Meleagris richmondi
		Meleagris, sp.
		Parapavo californicus
		Grus americana
	Grus conferta	Grus canadensis
		Rallus virginianus
Rallidae, sp.		Rallus limicola
		Fulica americana
		Catoptrophorus inornatus
		Charadrius vociferus
		Eupoda montana
		Squatarola squatarola
		Capella gallinago
		Numenius americanus
		Numenius phaeopus
		Totanus melanoleucus
		Erolia alpina
Limosa vanrossemi		Limosa fedoa
		Limnodromus griseus
		Recurvirostra americana
Gull, sp.		Larus glaucescens
		Larus brachyrhynchus?
		Rissa tridactyla?
	Shorebird, sp.	Phalaropus fulicarius?
	Brachyramphus pliocenus	Uria aalge
	Ptychoramphus tenuis	Synthliboramphus anticus
Cerorhinca dubia		Ptychoramphus aleuticus
	Mancalla californiensis	Stercorarius, sp.
	Mancalla diegensi	Columba fasciata
		Ectopistes migratorius
		Zenaidura macroura

Lechusa stirtoni

Palaeoscinis turdirostris

Geococcyx californianus
Tyto alba
Otus asio
Otus flammeolus
Bubo virginianus
Bubo sinclairi
Glaucidium gnoma
Aegolius acadicus
Spectyto cunicularia
Strix brea
Asio otus
Asio flammeus
Chordeiles acutipennis
Colaptes cafer
Phalaenoptilus nuttallii
Drycopus pileatus
Asyndesmus lewsi
Dryobates, sp.
Eremophila alpestris
Petrochelidon pyrrhonota
Cyanocitta stelleri
Aphelocoma coerulescens
Pica muttallii
Corvus corax
Corvus cryptoleucus
Corvus brachyrhynchos
Corvus caurinus
Nucifraga columbiana
Sitta canadensis
Sitta pygmaea
Chamaea fasciata
Toxostoma bendirei
Toxostoma redivivum
Oreoscoptes montanus
Turdus migragorius
Sialia mexicana
Bombybilla cedrorum
Lanius ludovicianus
Sturnella neglecta
Euphagus cyanocephalus?
Agelaius, sp.
Euphagus magnirostris
Pandanaris convexa
Tyrannus, sp.
Penthestes sp.
Xanthocephalus sp.
Icterus, sp.

Sayornis (says or nigricans)
Hylocichla, sp.
Regulus, sp.
Empidonax, sp.
Heleodytes, sp.
Pheucticus melanocephalus
Hesperiphona vespertina
Sarpodacus mexicanus
Spinus pinus
Spinus tristis
Loxia curvirostra
Pipilo maculatus
Pipilo fuscus
Pipilo angelensis
Pooecetes gramineus
Chondestes grammacus
Amphispiza bilineata
Amphispiza belli
Spizella passerina
Zonotrichia leucophrys
Passerella iliaca
Melospiza melodia

7.24.61

Calif Fossil Birds

	no. of species
Gaviiformes	5
Colymbiformes	6
Procellariiformes	13
Odontopterygiformes	1
Pelecaniformes	16
Ciconiiformes	10
Phoenicopteriformes	3
Anseriformes	35
Falconiformes	37
Galliformes	7
Gruiformes	6
Charadriiformes	28
Cuculiformes	1
Strigiformes	12
Caprimulgiformes	2
Piciformes	4
Passeriformes	51
	237

220 types

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CALIFORNIA'S FLIGHTLESS BIRDS

Flightless birds—those nonconformists of the feathered fraternity which have relinquished their freedom in the air—are a rarity in the world today. Out of a total of 25,000 known members of the avian class, there are but thirty-five which cannot fly. These are to be found only in the southern continents and neighboring islands. Since the extinction of the Great Auk of the North Atlantic, about a hundred years ago, no flightless birds have been known in North America.

In past geologic ages, however, four groups of such birds lived within the region which today we call the United States. One, a gigantic, ostrichlike creature named Diatryma, pursued its short destiny over the areas of Wyoming and New Mexico some fifty million years ago. Another, recorded by the name of Hesperornis, lived in the shallow seas which, over a hundred million years ago, covered certain interior areas of this country. Hesperornis, unlike the terrestrial Diatryma, was not a running bird, but was highly specialized for swimming and diving.

The remaining two North American flightless birds of the past appear to have been peculiar to the west coast, for their fossil remains are found only in southern California. These too, like Hesperornis, were aquatic birds, but their structural modifications for this type of life were less extreme.

A single upper wing bone of one of these was the first fossil bird bone to be reported from California. It was discovered many years ago, during the excavation of the Third Street tunnel in Los Angeles, in a stratum assigned to the Pliocene epoch of geologic time (approximately 10 million years old). This bone showed the peculiar modifications associated with the use of the wing for swimming rather than flying, though the particular characteristics were different than in any other known bird. On the basis of this single specimen, therefore, the species *Mancalla californiensis* was described, in 1901, by Frederick Lucas, one of the pioneer students of fossil birds.

Many other fossil birds have been found and described since Lucas' report, but it was not until 1937 that another specimen of Mancalla came to light—this time in San Diego. A third locality for this unusual bird was discovered last summer by a party from the Los Angeles County Museum exploring in the vicinty of Newport Bay. And at the same time still more specimens were found in San Diego.

Fitting together the various bits of information now available on this interesting bird of California's past, we can begin to visualize Mancalla more clearly in comparison with better known birds of parallel structure.

The two main groups of flightless birds which use their wings in swimming are the Great Auk, or Garefowl, of the north, whose extinction was previously mentioned, and the penguins of the Antarctic. These birds, although unable to use their wings in aerial flight, can be said to "fly" under water. The wing bones are flattened and shortened so that the wings become flipperlike. This condition is most marked in the penguins, in which even the feathers are short and scalelike, and the lowermost bones of the wing have become short, flat, shapeless blades. The modifications were less exaggerated in the Great Auk, and the feathers were more normal in appearance, though the wing was only about half the size which would have been required to carry the bird through the air. The feet are webbed in both groups, but are stubby and well padded in the penguins, longer in the Garefowl. The latter probably used its feet, as well as its wings, in swimming and diving; the penguin, on the other hand, keeps its feet straight out behind as it swims entirely with its wings. On land these birds are strongly handicapped, the short legs and erectly posed body producing a waddling gait. The penguins, ridiculous as their ambulations appear, can nevertheless travel at a fairly rapid gait on land, and are good jumpers. It is doubtful if the Garefowl, whose legs though longer were less sturdy, was as capable.

The wing structure of Mancalla shows the same flattening and shortening of the bones which characterize the latter forms. In degree of specialization it is actually intermediate between the Great Auk and the penguins, the modifications of the wing bones being more exaggerated than in the former, but less marked than in the latter. The bird was smaller than the Great Auk, standing possibly about a foot in height. The legs were short but slender as in the auk, not broad and squatty as in the penguins. In fact, in spite of the greater specialization of the wings, the actual relationships of Mancalla are clearly

MANCALLA

close to the auks, and the bird should probably be assigned to the same suborder at least. It cannot, however, be considered ancestral to the Garefowl, as its skeletal modifications had passed the point where there could have been any possibility of reconversion to the condition found in that bird. The idea of ancestry to the penguins is even more untenable. Not only does the penguin group stand widely apart from all other orders of birds, but fossil penguins from even earlier ages than that in which Mancalla lived show practically the same degree of wing specialization as do the living penguins.

We may say of Mancalla, then, that it was an auk-like bird of medium size, highly specialized for aquatic rather than aerial navigation; that it was apparently peculiar to the shores of California; and that it died out, leaving no descendants, several million years before there were ornithologists on earth to experience the thrill of its discovery.

The second of California's flightless birds appeared at a somewhat later time—toward the latter part of the glacial age, or Pleistocene epoch, fifty to a hundred thousand years ago. It seems to have been quite abundant, but for some reason it became extinct before historic time, probably even before aboriginal man set foot on western soil.

The history of the accumulation of information on this bird is an interesting one. It dates back about twenty-seven years to the discovery, in Santa Monica canyon, of two fossil leg bones showing great similarity to certain of the diving ducks (the Surf Scoter) but almost twice as large. Professor Loye Miller, of the University of California, after studying the bones, realized that they represented a bird heretofore unknown, and erected the species *Chendytes lawi* to contain them. Because of its size the bird was commonly referred to as "Law's Diving Goose." Since Miller's description in 1925, bones of this "diving goose" have been recognized in practically every marine Pleistocene deposit of southern California in which any bird remains were found. Additional specimens were taken from Santa Monica, and explorations at San Pedro, Playa del Rey, Los Angeles, and in Ventura county have all yielded bones assignable to this bird. But in every case the bones found were leg or pelvic bones—never a wing bone, breastbone, or portion of shoulder assembly. The disproportionate occurrence of leg elements, particularly as these appeared in some numbers, finally gave rise to the suspicion that the wing elements of Chendytes must have been degenerate—possibly entirely absent, or, more likely, small and fragile and thus not as readily preserved as the large, sturdy hind limb bones.

With this thought in mind, the bird remains from all Pleistocene marine localities in southern California were reviewed, and even the smallest slivers examined carefully. Among the specimens from Playa del Rey a fragment of shoulder girdle was found which gave evidence of degeneration and seemed to show characters relating it to the ducks. But the bone was too fragmentary to base any conclusions upon it.

CHENDYTES

Throughout 1946 the Museum's field party, collecting in the Newport Bay region, brought in a number of bird bones from a Pleistocene locality near the site from which bones of the earlier Mancalla had been taken. Among the first of these Pleistocene specimens were several leg bones of Chendytes, but though wing bones of other birds were found, none appeared which could be assigned to the "diving goose." However, the bird was so well represented by leg elements, and the work of excavation was being carried on so meticulously, it was only a question of time before the wing elements should appear, if they had ever been present. It was not a complete surprise, therefore, when in the late fall, two fragile wing specimens were discovered. One is of the same portion of the shoulder assembly represented by the fragment from Playa del Rey, and is structurally similar. The Newport specimen, however, is better preserved and, in spite of its small size and other signs of degeneration, its relationship to Chendytes cannot be doubted. The other specimen is an upper wing bone scarcely larger than that of a Ruddy Duck, and markedly atrophied. Although, owing to its greater degeneration, the wing bone does not exhibit the definite characteristics relating it to the diving ducks which are evident in the shoulder element, its assignment to Chendytes can hardly be questioned.

Though no skull, breastbone or lower wing bones of Chendytes have yet been found, it is now possible to form some sort of picture of the bird. Probably it had an over all length of 2 to 2½ feet. And we judge that it looked like a huge scoter duck, possibly even exhibiting the swollen area at the base of the bill which characterizes most of the modern scoters. The large, strong legs were placed far back on the body, which, as in many aquatic birds, produces greatest efficiency in swimming but presents a handicap when walking on land. The entire propelling power of Chendytes was concentrated in the legs. The wings, of course, were very small, and would have functioned, if at all, only as aids in balance. It is impossible to say with assurance that they bore even rudimentary flight feathers. It is likely that they did, and that the wings were thus observable from the exterior, but this cannot be determined until something is known of the lower wing bones to which the flight feathers attach.

Among living birds the only species which parallels Chendytes is the flightless Harris Cormorant of the Galapagos Islands. In this bird, too, the wings are small, though their atrophy has not reached as advanced a stage as that noted for the fossil bird.

Contrasting Chendytes with Mancalla, we find that these birds represent the two extremes of flightlessness associated with adaptation to aquatic life. They are obviously independent of each other. It would be impossible for the earlier Mancalla with its flattened, yet sturdily constructed, paddlelike wings and comparatively weak foot and leg structure, to have given rise to the heavy-legged, weak-winged Chendytes which inhabited the same area less than a million years ago. Presumably, over a long period of time, this area afforded protection from predatory creatures. Both species, then, at different times

MANCALLA *(Left)* AND CHENDYTES *(Right)*.

and in different ways, were able to overspecialize their swimming mechanism at the expense of flying. In Mancalla the loss of the function of the wing for flight was directly associated with its conversion into a superefficient paddle. In Chendytes the deterioration of the wing mechanism was presumably secondary to the development of aquatic capabilities. We may postulate that the hind quarters became overdeveloped with respect to the fore quarters, until the wings, no longer capable of lifting the body, lost all semblance of their former power.

It is curious that, except for the penguins, almost nothing is known of the ancestry of any flightless birds. Each species has appeared without antecedents, and the fossil forms have disappeared without progeny. Even in the penguins the modifications observed from the earliest to the latest forms (an evolutionary span of at least thirty million years) are so slight that they merely serve to indicate the tremendous period of time which must have elapsed in the entire course of their development. We must, therefore, lay our hopes upon the discovery of very much earlier types to reveal the course which nature has followed in producing these anomalies.

—HILDEGARDE HOWARD

Illustrations by Arminta Neal

Pleistocene.

The most significant data to be added to the information concerning the Pleistocene epoch, are the results of the Carbon-14 dating of one of the typical Rancho La Brea deposits from which bird bones were recovered. Samples of wood from a tree found in this deposit with bones packed solidly around it were tested in two laboratories and dates of from 14,000 to 15,000 years before the present indicated, ~~further information available~~ concerning the

The Anza desert fossil deposits ~~dated~~ as Pliocene on page 19, ~~are now~~ considered to be Lower Pleistocene age are now placed in the mammalian based on studies made on the mammalian fauna. Nineteen or twenty bird bones have now been found in this area. These presumably represent about 12 species, including turkey, ducks, geese, ~~perching birds~~ + birds of prey. Among the bones assigned to the latter category is a huge wing bone ascribed to the species (T. incredibilis) of Teratornis that exceeded that formed at R L B. This remarkable bird, whose wing spread might have been as much as 14 or 15 feet is a rarity among fossils, only one other bone having been found - in a cave in Nevada.

Of great significance in the study of the birds of R L B is the recent info. obtained as to the age of the asphalt deposits. Carbon 14 dating of a tree ~~from the pit~~ associated with the fauna ~~that has~~ one

shows that the R L B deposits of the typical fauna was living in the area 14,000 - 15,000 yrs ago.

Courtesy Chicago Natural History Museum

WONDER BIRD
OF THE ICE AGE

By

HILDEGARDE HOWARD

LOS ANGELES COUNTY MUSEUM LEAFLET SERIES
1950

SCIENCE, No. 3

TERATORNIS

THE WONDER BIRD OF THE ICE AGE

Southern California is justly proud of the fact that its mountain slopes provide shelter to the last of the California Condors—the largest living birds of flight, whose bodies weigh up to 27 pounds and whose spread of wing from tip to tip has been measured at ten feet.

If we turn back several thousand years in time—back to the days before even the Indian hunted along these shores, when the great ice sheets crept into parts of what are now the United States — we find that condors were abundant. They were abundant not only in the mountain areas, but in the wide valley which today is Los Angeles. Proof of the existence of condors here so long ago is afforded by the recovery of hundreds of condor bones from the asphalt deposits of Rancho La Brea.

In addition to the tar-soaked bones of these recognizable ancestors of the present-day California Condor, the La Brea deposits reveal the existence of a still greater bird which frequented this region some forty thousand years ago. This bird, known to science as *Teratornis merriami* (*terat* meaning wondrous, *ornis* meaning bird), was as much larger than the condor, as the condor is larger than an eagle. Its body was as broad as that of a coyote, and its wishbone measured eight inches across. The wings were very long, having an estimated span of eleven to twelve feet.

Rising above the body, and supported on a sturdy neck, was a head of amazing proportions and design. Broad and flat across the cranium, as in the eagles—though larger than any eagle known—the skull narrowed in front to a long, high, sharply compressed beak, over five inches in length and markedly hooked at the tip. In spite of the size and ferocious aspect of this skull, however, it was lightly constructed with only a narrow bridge connecting the beak tip with the cranium. And the lower jaw was very weak. Presumably the beak was used as a sharp, piercing or tearing tool with which to rip through the hide of a dead animal and reach the entrails and softer fleshy parts of the body. For Teratornis, like the condor, appears to have been a vulture in its habits, subsisting on the carcasses of dead animals. Not only the structure of the beak, but the feet as well point to this conclusion. The heavy body of Teratornis was borne on short legs, similar to those of the condor. The toes were long and weakly constructed, and the claws were relatively small—a foot amply developed to support the weight of the bird in walking, but totally lacking in resemblance to the sharp, grasping, carrying talons of the more predacious eagle.

Teratornis is the largest flying bird known to science. Condors and albatrosses today fall far short of its massive body size. Other larger-bodied birds, such as the ostrich and its allies, are completely incapable of flight. One may wonder how a bird even as large as Teratornis could raise its body from the ground. That it did take to the air and fly is unmistakably shown in its stoutly constructed, long wing bones which bear evidence of strong feather and muscle attachments. The breastbone, too, shows the presence in life of powerful muscles of wing propulsion. The exact expanse of the wing in full feather can, of course, only be postulated. The skeleton mounted in the Hancock Hall of Rancho La Brea fossils (Los Angeles County Museum) measures 7 feet 3½ inches from wing tip to wing tip. It is reasonable to believe that in life the flight feathers extended at least two feet beyond the skeleton on each side, as in the California Condor today. In fact, if the wings of Teratornis were proportional to those of the condor, the extent of the feathers would have been more than thirty inches, giving a total wingspread of slightly over 12 feet for a bird the size of the one displayed in the Museum. Though this span may be equalled in the Wandering Albatross, the latter is a much lighter bird than either the condor or the teratorn, and its wings are extremely slender and pointed, contrasting markedly with the broad expanse characteristic of the living condor. The structure and proportions of the wing bones of Teratornis suggest a breadth of wing more nearly like that of the condor.

The tail of Teratornis must have been large to judge from the very well-developed bone to which the tail feathers attached. Altogether, Teratornis appears to have been a bird of strong flight, with probably greater flapping power than the condor, which today is considered one of the most perfect of nature's airplanes.

Where the teratorns dwelt, what manner of nest they constructed, and the number of their young are matters of conjecture, all evidence being long since lost to science. As they are unrelated to any family of living birds, we have no form with which to make exact comparison. They have been likened most closely to the condors, and presumably in manner of feeding, and perhaps flight, a parallel may be drawn.

The fossil deposits in which the bones of Teratornis are most numerous are those which have accumulated in fairly open country, devoid of forests. The difficulties of navigation of so large a bird through thickly wooded sections can be readily appreciated. That Teratornis at times sought shelter in the mouth of a cave is demonstrated by the discovery of its bones in a cavern deposit at 7,000 feet elevation in Nuevo León, Mexico. It is entirely probable that, like the condor, Teratornis nested in caves, where, high on a cliff and sheltered from inclement weather, its young, which undoubtedly required parental care for several months, would have been safe from attack by enemies. Among the condors today, even the tree selected as a roosting site is usually located in mountainous regions, where a canyon slope beneath affords opportunity for easy launching of their great bodies into the air. The feeding range of condors is known to extend for many miles from the nesting or roosting site. The teratorns found in lower areas, such as Rancho La Brea, likely had their homes in the Santa Monica Mountains, or in ranges farther inland.

With this brief reconstruction of the "Wonder Bird" of the Ice Age, how does he fit into the Ice Age picture? Abundant in our California asphalt deposits of the Pleistocene epoch, lesser numbers of skeletons of this bird are also known from deposits of the same age in Florida and in Mexico. Teratornis, then, was no doubt a common associate of the Saber-tooth Cat, the Mammoth, the Sloth, and other animals characteristic of the Ice Age in America. Remembering that this was the age of mammals of great size, it is not surprising that there should have existed, among the birds, vulturine forms of commensurate proportions, to feed upon the dead bodies of those great creatures.

Food was plentiful in those early days. Abundant grasses, herbs, and trees supplied the needs of plant-eating creatures (the so-called herbivores), which in turn became the food of the flesh-eaters (or carnivores). So great were the numbers of herbivores, that the carnivores of that time far exceeded those of today, both in size and in variety. Among the birds were numerous species of eagles and vultures. But the greatest of all of these was Teratornis. Of the large birds, today only two eagles and one condor remain in our country—the condor confined to the mountain fastnesses, and becoming so rare we fear its extinction. In the Pleistocene epoch, conditions in this region were in striking contrast to those of today, and according to excavated remains from the Rancho La Brea fossil deposits, eagles, condors and teratorns once abounded within what are now the city limits of Los Angeles.

Shall we look back upon a sunny morning at Rancho La Brea about 40,000 B. C.? What more propitious spot for catching a glimpse of Teratornis, than the famous "death trap" where an unwary beast lies dying at the tar pool's edge? The sky overhead is dotted with the circling forms of teratorns. One by one, they descend upon the carcass, aware as if by instinct that the great beast is dead. A jab with the hook of the beak, a thrust of its sharply-angled edge, and one bird's head is buried in the still warm flesh. Crowding and pushing, the great vultures swarm over the body, so intent upon the feed, they are oblivious to the danger of the trap. Suddenly one bird, then others, slip from the carcass, and their feet, or balancing wing tips, entangle with the sticky tar. The meal forgotten, they struggle frantically, only to become the more enmired, while heedlessly their hungry companions complete the destruction of the carcass.

Now surfeited with their feast, those which have escaped the treachery of the trap stand basking in the sun at the pool's edge, preening a feather here and there, stretching their huge wings slowly. At last, after a considerable period, one bird, apparently recovered from the lethargy produced by heavy eating, bestirs himself to leave the spot. Running, with wings

corrections and suggestions
for the MS. of

FOSSIL BIRDIES

NOTE: I'm not familiar with Science habits, but the MS. seems to show some irregularity as to when, and when not, names are set in italics. Evidently the scientific names of individuals are, but the names of their Orders aren't. I'm doubtful in cases such as "Sulidae" (p.11 in MS., middle of page). The MS. should be checked for uniformity on this point, but I am not qualified to do it....

P.4 -- (4th line from bottom) "Frontispiece" should have a capital "F" and be set in italics

P.5 -- Unless the rule varies in Science publications, reference words followed by a numeral should be capitalized and abbreviated (e.g. "Fig. 5" and "No. 3" rather than "figure 5" and "number 3").

Accordingly, "figure" on line 4 of this page, and all other references through the text (cited here below) should probably appear as "Fig."

Two lines later, the "as bird, as many" might read a little smoother if changed to "since" many, or "for" many

P.6 -- Spelling, "ancient" (line 2)

On line 11, what about the comma after "though"? It gives the first impression of "had become avian, though" whereas I think you mean "though in the two best-known groups" etc.

Two lines later, an incompleted bracket appears in pencil at the beginning of the line. Did you intend to show a parenthetical remark, or only mean to move "The" one letter to the left?

(Next paragraph, line 2) Use "Fig." instead of "figure"

P.7 -- (5th line from bottom) For "Fig. 3" (not "figure" 3) what about parentheses? This may be awkward, though, following the already parenthesized Dyatryma

P.8 -- (8th line) Not "figure 4" but "Fig. 4"

P.10 - (3rd line from bottom) Might you say "This" material, rather than "The" material?

P.11 - (2nd line) "See Fig. 5" rather than "figure 5"

P.12 - (the 3rd line) I believe "holdover" is written as one word

(line 9, and the 3rd line from bottom of page) Use "Fig."

P.13 -- (5th line from bottom) As I understand it, this Godwit is represented only in a skeletal imprint. Should the word "specimen" then be used? It sounds s'if there were an actual birdie someplace

P.14 -- On the second line, maybe "on" rather than "in" would be better for the California horizons

P.15 -- (3rd line from bottom) Wasn't the size of the Howard Goose close to "that of" the Canada Goose?

P.16 -- (7th and 8th lines) I think another hyphen is needed, for "river-" or lake-laid beds

P.17 -- (line 7) Should it not be "fauna" (which is already plural, I believe), rather than "faunas"?

P.18 -- The second paragraph should be checked for capitalizations. I don't know the 'fine points' of Science usage. Probably the names of individuals are capitalized, but not the names that indicate a whole family. Anyway - should the cormorants and shearwaters have capitals?...

P.19 -- (9th line) The "also, and, in" gets a little complicated. Might the comma be omitted after "and"? Or, might the "in addition" be omitted?

Three lines later, I don't much like this use of "likely." Likely has a special meaning, and I believe "probably" or one of its cousin words would better fit your meaning here

P.20 -- (Last line of 1st paragraph) I think the plant growth wasn't "favored" (as, favored by Nature), but was "favorite" with the fool Eagles. Unless I mistake your intention, "favorite" might better express your idea

P.21 -- (first line) was/were?

(3rd paragraph, 3rd line) Is it an understatement to say that the Passenger Pigeon has become extinct within "historic" time? I had always thought this birdie disappeared within quite "recent" or "modern" days

Three lines later, use "Fig." rather than "figure"

P.22 -- (5th line) Is there a hyphen in it, properly, or is it written "lifelike" as one word?

And 2/3 of the way down the page, use "Fig." (not "figure")

P.23 -- (Line 7) I think you mean altitudinal rather than vertical

(2nd paragraph, line 4) Would you like to say "and" the wings?

Next line, "Figs." rather than "figures"

Five lines later, the same

P.24 -- I believe a semicolon, rather than a comma, might help at the end of the 3rd line

(Line 6) "Fig." rather than "figure"

(4th line of last paragraph) Ditto

P.25 -- (End of first line) Offal "occurs" regardless all the time, all over the world, ~~and has nothing to do with~~ the tastes of Neophrontops americanus, or its selection of sites. The presence of offal might encourage, or invite, visitations of the bird; but your text suggests that the birds centred where it was to be found

(2nd paragraph, line 2) "Fig." rather than "figure"

(center of page, end of a line) I'm uncertain, and I think the typesetter would be uncertain, about the spelling of this word. Is it Audobonds, or Audobond's?

NOTE: This is the paragraph for which I was allowed some latitude, accordingly as space allowed in the "dummy." There was space only until (2) -- and the last sentence had to be omitted. It should be deleted from the MS.

P.26 -- (line 12) "Fig." and not "figure"

Two lines later, should "Vultures" be capitalized? Six lines later, it appears with a small "v" -- and also, in the latter reference, "old world" has no capitals though it so appeared above....

(line 2, last paragraph) "Fig." rather than "figure"

P.27 -- (end of line 8) "Sex differences" sounds like a marriage headed toward divorce. Might you say "the differences of sex", or, "differing sex"?

(last line of 1st paragraph) "Fig." again

(4th line from bottom) Should this not have a hyphen, and appear as "tree-nesting"?

P.29 -- (7th line in 2nd paragraph) "Fig. 17" and not "figure"

P.34 -- (close of 1st paragraph) A hyphen is needed, for "water-" and shore-dwelling birds. The same rule applies to "Brush-" in the third line from bottom of the page

P.35 -- (4th line from the end) I think "lifetime" is one word

P.37 -- I believe the list of illustrations ought to include the Frontispiece....

P.38 -- Here, and elsewhere, should the definitive names of eras (e.g. p.38 l.3) appear in italics? It might make the captions a little easier to read....

h.w

1-11-45

ALSO....

Pp. 2,a and 2,b -- All, "Fig." rather than "Figure"

P.3,a -- (End of line, 2/3 of the way down the page) I believe "lifelike" should appear as one word, without the hyphen

Next line, would "as" achieved be better?

P.4 -- (end of 2nd line, 2nd paragraph) After "course" I think a dash might help, with a comma after "instance" on the next line

Next line, "types of life habits" might better be "types of life habit" or, "types of life-habits"

Audubon Soc
Pasadena June 8, 1929

Prehistoric Birds of California

A Introduction

1 Fossil Birds

2 Birds associated with Indians

B Difference between studying modern & fossil

Modern: Birds in all countries & habitats

2 Plumage, behavior, song.

fossils: Dependent on fortune finding them

a. Bird happened to die

b. Happened to die where bones were easy

c. Happened to be later exposed

d. Happened to be brot to attention of scientists

1 Only the skeleton.

C Tell this that you may appreciate how lucky we are in So. Calif. to [illegible] have as much material as we have

1. ~~Fossil Birds in~~ Over 150,000 specimens representing about 90 species.

2. These come from 19 ~~nine~~ localities located in 4 different counties

3. And represent birds from ~~6 pits~~ different habitats

4. / 3 Geological periods represented

Card 1a

D Take birds of earliest geologic period first

1. Note greater % of extinct species

2. ~~Three~~ localities - Calabasas + Lompoc + Barston

1B Lompoc

1C Calabasas - Barston

E. Pliocene 1 species similar to murre but flightless. marine.

CAT. NO.

ACCESSION NO.

SC. NAME

COMMON

LOCALITY

COLLECTOR

DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

Kern County
McKittrick Pleistocene - Lacustrine
San Bernardino County
Barston - Pliocene - Mesa
Sta. Barbara County
Lompoc - Miocene - Bay
Carpinteria - Pleistocene (Coastal plain forest
Packard's Hill - Pliocene
Los Angeles County
Calabasas - Miocene (marine
31d St Fernando - Pliocene (marine
La Brea - Pleistocene (Mesa
Sta. Monica - Pleistocene (marine
San Pedro - Pleistocene (shore)

marine
Bay
Littoral
Beach
fresh water
lake
land
mesa
forested coastal plain

CAT. NO. ACCESSION NO.

SC. NAME

COMMON "

LOCALITY

COLLECTOR DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

Lompoc

5 Fish-eating marine birds
1 Shore bird similar to Dowitcher but distinct

Fish eaters

n. sp. 1. Shearwater - nearest Black-vented

n. sp. 2. } Red-footed Booby in size (willetti)
n. sp. 3. } Gannets or Boobies
Gannet in size

n. gen. sp. 4. Miosula - Gannet-Cormorant
Shorter feet & shorter wings than Gannet
weaker feet & longer wings than Cormorant

n. sp. 5. Auklet - Similar to Rhinoceros but distinct

n. sp. 6. Godwit or Curlew type

Herring here & other fish
Quiet shallow Bay. Very
little drainage from fresh water.

Impression Nearly complete skeletons
preserved in a white chalky
substance made up of
microscopic shells of
marine diatoms tiny
plants that grew pro-
fusely in quiet what-

CAT. NO.

ACCESSION NO.

SC. NAME

COMMON "

LOCALITY

COLLECTOR

DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

1C

Calabasas

Corvorant – n. sp.

Marine

Barstow

2 Hawks –
1 larger than Buteo Borealis
1 smaller (bet. ~~Buteo~~ Borealis & Swainsons

Mesa

CAT. NO. ACCESSION NO.

SC. NAME

COMMON "

LOCALITY

COLLECTOR DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

F Pleistocene (2)

1. Marine Pleistocene — Sta Monica + San Pedro
no Boobies
Smaller percent extinct
18 — 3
S.M. 2b — Chendides - goose-like diver
S.P. 2a { ? Sounder limited loon
? albatross - may be black footed

2. Best to the last — 3 asphalt deposits
occur in ~~area~~ each of 3 counties
Represent 3 different habitats
Lake - shallow - with rushes
mesa - gently wooded
Forest coastal plain
a Largest of these is at Rancho La Brea
Now excavated.
Preponderance of Raptores
3 condors
1 Teratornis
1 old world vulture
2 new world vultures
7 eagles
1 Kite
5 hawks
4 falcons
1 Caracara
7 owls
1 grebe - few ducks, 1 - goose
Ibis - 2 storks
1 Heron - 1 Bittern
3 Cranes
shorebirds few crow + Raven
Pigeon - dove
120 species - Flicker - Meadlark - Shrike

CAT. NO. Bi 68. ACCESSION NO.

SC. NAME Pelecanus cl

COMMON "

LOCALITY

COLLECTOR DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

San Pedro

? Loon - slender limbed possibly distinct (1)
Common Loon? (1 - showing beach wear.)
Ancient Murrelet (1)
? Albatross - near Black-footed (1)
Black-vented Shearwater (1) Often on beach (sooty & mixed)
Pacific Fulmar (1)
Brandt cormorant (1)
Mallard (1)
Green-winged Teal (3)
Cinnamon Teal (2)
Surf Scoter (3) (abundant today)
White-fronted Goose (1)
Canada goose
California quail (3) Startingly in marine deposit
Turkey Vulture (1) Common beach scavenger
Meadowlark (2) - common in sandduneswaltgrass

Beach

~~Bifurcate bones~~

Separate bones

CAT. NO.

ACCESSION NO.

SC. NAME

COMMON "

LOCALITY

COLLECTOR

DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

Santa monica

Cheilitas
a large dusserine diver
Phalacrocorax auritus

CAT. NO.

ACCESSION NO.

SC. NAME

COMMON "

LOCALITY

COLLECTOR

DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

(2C)

Rancho La Brea

150,000 specimens
58 spp.

Small grebe - entrapped today too - ponds of water with reeds.

Mallard?

Green-winged Teal? } few

Canada goose - many

E a pigmy goose or longlegged Duck

S Roseate Spoonbill

White faced glossy Ibis (1)

Wood Ibis? (1)

S Large stork - Jabiru

E S Austrian stork - related to stork of Argentina

Ardea herodias

Bittern? (2)

Little Brown crane

Sandhill crane

L Large crane near americana (whooping Crane

a few shorebirds

California quail

Turkey

Pigeon (1)

Mourning Dove (2)

Condor

E S 2 other large condors

E Turkey-Vulture + Black Vulture

E Teratornis

White-tailed Kite

Marsh Hawk

Cooper Hawk

Sharp-shinned Hawk

Red-tailed + Swainson

E S golden eagle, Bald Eagle, 3 related to So. Amn.

E 1 long legged eagle

E 1 bet. Bald eagle + old world vultures

Old Neophrontops

L Prairie falcon } and an intermediate form

Pigeon Hawk

Swainson Hawk

S Caracara

Barn owl

Screech owl

Horned owl

Eared owls

Burrowing owl

Pigmy owl

Roadrunner

Cliff Raven

Crow + Raven

Meadowlark

Shrike

Flora a coastal grade, comparable to the present wooded hills of the Calif. Coast Ranges

CAT. NO.

ACCESSION NO.

SC. NAME

COMMON "

LOCALITY

COLLECTOR

DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

F. Pleistocene - continued

b. A little north of La Brea in Sta. Barbara County is another asphalt deposit - at Carpinteria.

3a

Again a preponderance of Raptores no waders - 1 duck

c. A little further northward and inland is the McKittrick deposit

Asphalt occurred at margins of shallow lake - or series of pools with rushes + sedges.

3b

Preponderance of water birds

2 species ~~of~~ nelsi spp (~~Caracara~~ Falcon)

Caracara

Caracara dickeyi

large as whistling swan

No gulls or divers or pelican probably water too shallow tho no gulls noted in our So. Calif. Pleisto at all (Samples from Lead Lake, Oregon)

G. Conclusion

~~15 species~~

3 grebes + loons

12 marine fish-eaters

14 ducks or geese

6 shorebirds

9 herons, cranes + storks

3 4 Raptores

5 land birds

7 passerines

21 extinct

CAT. NO. Bi 41. ACCESSION NO. 185

SC. NAME Phasianus reevsi

COMMON "

LOCALITY a b c d e f g h i j k l m

COLLECTOR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 DONOR

IDENT. BY 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

CONDITION

REMARKS

DISPOSITION

30

Carpinteria 1,000 specimens
16 spp.

Mallard ? (2)
Pintail (17)
Calif. Quail (1)
Condor (4)
Teratornis 1
Golden eagle 2 ♂
Buteonid hawks 1 ♂
Neogyps 1
Neoplesiotypus 1
Caracara 2
Horned owl 2
Flicker
Road Runner
Raven
Passerine 1

Coastal plain (flora coastal)
a forest flora similar to
of Carpinteria
that existing today on slopes
back of Monterey Bay

CAT. NO. Bi 29. ACCESSION NO. 630

SC. NAME Grus cinereus

COMMON " Grey Crane (Europe)

LOCALITY

COLLECTOR DONOR

IDENT. BY

CONDITION Complete

REMARKS

DISPOSITION

38 McKittrick 1,500 specimens 40 spp

Pied-billed Grebe
Mallard Duck
Bald Pate
Green-winged Teal
Cinnamon Teal
Pintail
Shoveller
Red head
Ruddy duck
Snow Goose
Branta - large as Whistling Swan
Jabiru
Great Blue Heron
Little Brown Crane
Virginia Rail (not many - not flocks - so few as Sandpipers)
Avocet
Dowitcher
Greater Yellow-legs
Red-backed Sandpiper
Killdeer - (more upland birds - scarce here)
California Gull - few
Mourning dove (few) (rarely alight in Marsh area)
Teratornis
Marsh Hawk
Ferruginous Rough-leg
several spp. of eagle Aquila - Golden Eagle
Neophrontops
Duck Hawk
Peregrine Falcon (Mexicanus) Prairie falcon, Sparrow hawk
Swainson Falcon (very large)
Caracara
Horned owl
Burrowing owl
Roadrunner (1)
Raven
Cliff Swallow (mistakes oil soaked earth for mud for building)
undentified passerines

CAT. NO. Bi 167. ACCESSION NO.

SC. NAME Cepphus cl

COMMON "

LOCALITY

COLLECTOR DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION

15 ducks and geese
other water birds

G Conclusion
948 species
5. Diving birds auks murres puffins
3. Tube nosed swimmers pelagic freshwater
8. Totipalmate swimmers Boobies
15. Ducks & geese
7. Herons - storks
4 Cranes & rails
6. Shorebirds
2 gallinaceous birds
2 Pigeons & doves
34 raptores
6. Owls
8. passerines

21 extinct
most outstanding
large goose - Litodiven Chendytes
large goose Branta dickeyi
" stork
Teratornis
Neophrontops
Wetmoregyps
3 other very large ones
large falcon

CAT. NO. Bi 138 ACCESSION NO.

SC. NAME Geococcyx calicornicus

COMMON " California Road

LOCALITY

COLLECTOR DONOR

IDENT. BY

CONDITION

REMARKS

DISPOSITION